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This document is a summary and evaluation of a 3-year interdisciplinary, interagency effort to improve vocational education. Twenty-nine component reports are summarized and interpreted with resumes in four interrelated efforts: (1) Identification of socioeconomic factors that affect pupil's occupational and educational aspirations, expectations and plans. (2) Identification of clusters of capabilities (concepts, knowledge, skills and attitudes) that are widely useful in occupations providing opportunities for youth who do not complete college. (3) Development and pilot testing of semi-self-instructional systems designed to help pupils acquire levels of cognitive and motor capabilities defined as adequate for effective work, and (4) Experimental organization of U.S. Navy training aids for use in civilian vocational education programs. Plans for continuation of related work are summarized. (MM)

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FINAL REPORT
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SUMMARY, EVALUATION AND LONG-RANGE PLANS FOR RELATED WORK

September, 1968

U.S. DEPARTMENT OF
HEALTH, EDUCATION AND WELFARE

Office of Education
Bureau of Research

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by
Gordon McCloskey

September 1968

The research reported herein was performed pursuant to a contract with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

Washington State University, Department of Education, Pullman, Washington
State Coordinating Council for Occupational Education, Olympia, Washington

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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Preface

YOUTH GROWING

They hold blueprints in their genes

They have plans in their bones

The future is alive in their blood

Centuries of Greek - Hebrew - Mongol - Anglo reason proclaim ancient definitions of their personal rights and their civic obligations

But their grey cells are restless

they ponder new concepts of growth and motives

they ask confounding questions about work and values

They are heir to everything

they will operate every factory, farm, store, home, school, office and laboratory on which this cybernated age depends

They're going to run the works

So - - fellow educators, what are we going to do about this ?

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ACKNOWLEDGEMENTS

The entire Project staff affirms its appreciation for the leadership of Dean George B. Brain who comprehends the national need for modernized occupational education. We also record our thanks for his many days and nights of staunch support of the Project here at Washington State University and in the U.S. Office of Education.

To Department Chairman, Lloyd B. Urdal our thanks for helping staff the Project and expediting effective working arrangements.

To Washington State Director of Vocational Education, Ernest G. Kramer, and to State Superintendent of Public Instruction, Louis Bruno, our thanks for moral support and financial assistance.

Our respects and gratitude to Northwest Regional Educational Laboratory Director, Lawrence D. Fish and to Title III Directors, Arnold M. Gallegos and Paul Ford for their insight and assistance which contributed so substantially to this cooperative endeavor.

And many thanks to the numerous USOE staff members who contributed so much thought and consideration.

The author gives his personal thanks and regards to Project staff members, graduate students and secretaries who prepared the twenty-nine reports summarized in this document.

SUMMARY

This document is a summary and evaluation of a 3-year interdisciplinary, inter-agency effort to improve vocational education. It presents resumes of four inter-related efforts.

Identification of socio-economic factors that affect pupils' occupational and educational aspirations, expectations and plans.

Identification of clusters of capabilities (concepts, knowledge, skills and attitudes) that are widely useful in occupations providing opportunities for youth who do not complete college.

Development and pilot testing of semi-self-instructional systems designed to help pupils acquire levels of cognitive and motor capabilities defined as adequate for effective work.

Experimental organization of U.S. Navy training aids for use in civilian vocational education programs.

Plans for continuation of related work are summarized.

PURPOSE OF THIS REPORT

This FINAL REPORT summarizes and interprets 29 component reports completed by Projects No. ERD-257-65 (Contract No. OE-5-85-109) and Project No. OE7-0031 (Contract No. OEG-4-7-070031-1626.)

The general nature of work to be pursued under the latter contract was defined in our "Proposal for Second Stage of Vocational-Technical Education Research and Development Project (ERD-257-65) submitted on January 15, 1966. Due to negotiated budget limitations, the scope of work was subsequently limited in accord with two modified budget agreements filed with Project Officer John Bean on November 23, 1966 and on February 14, 1967.

In August 1967 it became plain that visual aids developed by the U.S. Department of Navy could be very useful in the vocational instruction systems being developed by the Project staff. Consequently by agreement confirmed by our September 25, 1967 memorandum to Project Officer, Sidney High, we utilized some funds to arrange access to Navy materials and began development of procedures for arranging them in forms suitable for use in civilian manpower training and vocational education programs.

This report deals primarily with work financed by contract No. OEG-4-7-070031-1626 between December 1, 1966 and September 30, 1968. However, that work was a follow-up of work begun by Project ERD-257-65 under Contract No. OE-5-85-109. A FINAL REPORT on that contract was filed with Project Officer, John Bean, on February 3, 1967 and was accepted by USOE. However, to clarify continuity of work, this report summarizes, interprets and evaluates the totality of work completed under both contracts.

This report also includes a statement of Washington State University's plans to utilize its own resources for further pursuit of work initiated during the past three years.

OBJECTIVES

The major objectives of both Project No. ERD-257-65 and Project No. OE7-0031 were:

To identify and define clusters of capabilities (concepts-knowledge-skills-attitudes) essential for work in present and future occupations most likely to provide opportunities for youth who do not complete college.

To identify psychological, sociological and economic factors influencing pupils' opportunity and willingness to pursue education necessary for development of capabilities essential for employment in modern occupations.

To develop vocational-technical curricula and instructional materials designed to speed and extend pupils' acquisition of occupational capabilities, with particular regard for the special instructional needs of socio-economically disadvantaged pupils.

To pursue the above goals cooperatively with State Department of Vocational Education, Community Colleges, local school systems and other educational agencies, as means of laying foundations for wide-spread dissemination and use of results of Project work.

PHILOSOPHY AND RATIONALE

Philosophically, all Project work has been designed to help implement the ethical and political principles of a free society which values the capacities of individuals, the dignity of man, equal opportunity, and each person's responsibility to do a fair share of work.

We assumed that educational agencies supported by all taxpayers have obligation to help all pupils acquire ability to produce useful commodities and to earn incomes that purchase fair shares of necessities and luxuries.

We assumed that a democratic society has moral obligation to provide types of instruction and guidance necessary to enable socio-economically disadvantaged youth to acquire occupational competence. We assumed that an interdependent society has a self-interest in doing so.

We assumed the validity of research indicating the growing need for higher levels of occupational competence and the increasing rapidity with which occupational requirements change.

We assumed that vocational curriculum and instructional procedures should be based on facts about emerging occupational opportunities and on awareness of psychological, social and economic factors that influence pupils' occupational perceptions, opportunities and decisions.

Our motivational studies have been based on a respect for each pupil's right to perceive the new and changing opportunities available to him, and on recognition of the school's responsibility to obtain sociological and psychological facts essential to help pupils acquire perceptions congruent with personal and national well-being.

Our clusters research has been based on an assumption that it is possible to identify clusters of capabilities (combinations of concepts, knowledge, skills and attitudes) most likely to maximize career-long occupational opportunity, competence and choice in an evolving technological society. Design for our clusters studies assumed that practically all workers need basic reading and arithmetical competencies. Proceeding on that assumption we focused most of our efforts on identifying clusters of additional cognitive and affective capabilities enlarging occupational capability and choice.

We assumed that modern instructional technology can be used to develop instructional systems that help more pupils more rapidly acquire essential levels of occupational capabilities.

We assumed that general education can and should make substantial contribution to pupils' occupational competence. For that reason, we have developed prototype procedures for teaching occupationally useful science and mathematics that can be used in general science and mathematics classes.

On the basis of research indicating the nature of dissemination-utilization-adoption processes, we assumed that whenever feasible, the planning and conduct of research, development and field testing should involve personnel of State Departments, Community Colleges and local school systems and professional organizations.

Recognizing the obvious shortage of qualified research and development manpower, we assumed that in cases where objectives were related, cooperative work with other research and development groups would enlarge results. On that basis much of our instructional system development and field testing has been pursued jointly with a Title III project and with the Northwest Regional Educational Laboratory.

We assumed that psychologists, sociologists, economists, mathematicians, chemists, biologists and physicists can help vocational educators obtain facts identifying needs and better ways of meeting modern needs. Consequently, at various times representatives of those disciplines served on the staff and as consultants.

We assumed that honest and efficient research and development designs include self-correctional mechanisms and alternative routes for adjusting to unpredictable discoveries or difficulties. The following examples illustrate applications of this principle. (1) We combined part of our Office Occupations work with that being done by Michigan State University. (2) For use in projected instructional system development we obtained access to high quality instructional aids available at the Treasure Island U.S. Naval Training Aids Center. (3) When budget requests had to be reduced we delayed completion of our projected Child Care and Food Service studies.

PROCEDURES AND RESULTS

Motivational Studies

Six motivational studies utilized combinations of interview and questionnaire techniques. Titles of those reports and dates on which they were transmitted to USOE follow.

Walter L. Slocum and Roy T. Bowles, "Educational and Occupational Aspirations and Expectations of High School Juniors and Seniors in the State of Washington," FINAL REPORT NO. 1. Transmitted to USOE February 3, 1967.

The purpose was to identify educational and occupational aspirations and expectations of eleventh and twelfth grade students in Washington high schools. Data selected will be of value to principals, teachers, and counselors.

A proportional, stratified random sample of high schools was drawn and questionnaires distributed to cooperating students in those schools. Data were categorized by sex and year in school and processed by computer.

Nearly all respondents aspired and expected to graduate from high school and to get some kind of post-high school education. Data reflect the growing importance of the community college system. A large proportion of respondents desire and expect to obtain vocational training after leaving high school. Educational orientations and expectations of students and their families vary from one community to another.

Apparently, the majority of respondents were still in the process of formulating educational goals. Girls were more certain than boys about their occupational goals or expectations. A majority of the respondents desired business education training and training in skilled trades in high schools. Nearly all respondents believed that education is important in preparing for a job and exhibited positive feelings about school. In comparison with a similar 1955 study, there appears to be an increase in preference for professional occupations.

LeRoy C. Olsen, "Development and Standardization of a Projective Occupational Attitude Test," FINAL REPORT NO. 2. Transmitted to USOE February 3, 1967.

The objective was development of a projective technique to help non-college bound youth make occupational decisions most likely to yield satisfaction and success. The technique was designed to provide teachers and counselors with information about pupils' present attitudes toward basic dimensions of occupations in which they are most likely to find opportunity.

The instrument consists of ten drawings depicting scenes of unskilled and semi-skilled male occupations. The test is designed to measure attitudes toward five basic dimensions of work--tools, materials, nature of work, interpersonal relationships, and work environments. The drawings are shown to the subject by an interviewer who elicits free responses. Then the interviewer asks the subject a series of three questions to evoke further response.

For a report on further development of this technique, see LeRoy C. Olsen and William H. Venema, "Development of a Projective Technique for Obtaining Educationally Useful Information Indicating Pupils' Attitudes Toward Work and Occupational Plans," Project No. OE7-0031, Contract No. OEG-4-7-070031-1626, FINAL REPORT NO. 21.

Harold G. Heiner, Warren K. Garlington, and James E. Whipple, "A Forced-choice Procedure for Measurement of Pupils' Attitudes Toward Major Dimensions of Work," FINAL REPORT NO. 3. Transmitted to USOE February 3, 1967.

The objective was development of a forced-choice occupational attitudes inventory designed to measure pupils' attitudes toward component dimensions of non-professional level work involved in office, retail, health service, and construction occupations.

Dimensions measured are tools, materials, nature of tasks, personal relationships, and work environments. The inventory is designed so that each subject arrives at nine answers (preferences) derived from nine groups of questions. There are ten forced-choice questions in each group--a total of 90 questions.

The inventory was pilot tested using 153 junior high school students in three selected school districts. Student attitudes appeared to be quite definite with regard to the dimensions of occupations, even though their occupational choice by job title may have seemed quite unrealistic.

Pilot testing indicates that the inventory has substantial potential to provide counselors and teachers with facts about pupils' existing attitudes. For report on further development of this instrument see Toshio Akamine and Harold G. Heiner, "Development of an Experimental Forced-choice Occupational Preference Inventory," Project No. OE7-0031, Contract No. OEG-4-7-070031-1626, FINAL REPORT NO. 23.

Roy T. Bowles and Walter L. Slocum, "Social Characteristics of High School Students Planning to Pursue Post High School Vocational Training," FINAL REPORT NO. 17. Transmitted to USOE July 1, 1968.

The purpose was to compare characteristics of students planning to take post-high school business education or other types of vocational education with those of students planning to attend or graduate from college and those of students who plan to terminate their education with high school graduation.

Data were drawn from an Educational and Occupational Aspirations Study (see FINAL REPORT NO. 1). The sample consisted of juniors and seniors in twelve randomly selected high schools in Washington State.

Students planning business or vocational training did not score as high on factors associated with high levels of educational expectations as did students planning to attend or graduate from college. On some factors they scored higher than students planning no education after high school; on other factors they scored much the same as those planning no education after high school.

Comparisons were made in terms of: (1) school experiences and attitudes toward school including grades, interest in school work, self-image of scholastic

ability, courses taken, and extracurricular activities; (2) family background characteristics including father's occupation, parents' education, and perceptions of family income, and willingness of parents to finance education, and encouragement from parents; (3) peer group characteristics including number of friends who dropped out of school, proportion of friends planning to attend college, and encouragement from friends.

A majority of students planning business or vocational training planned to enter occupations for which such training will prepare them. However, a significant minority showed an incongruity between educational and occupational plans.

LeRoy C. Olsen and William H. Venema, "Development of a Projective Technique for Obtaining Educationally Useful Information Indicating Pupils' Attitudes Toward Work and Occupational Plans," FINAL REPORT NO. 21. Transmitted to USOE September 30, 1968.

The purpose was to further develop a projective technique for obtaining evidence of youths' attitudes toward some representative types of work and toward factors associated with their occupational aspirations and planning described in REPORT NO. 2.

Directions are described for using ten drawings to evoke responses indicating a person's occupational preferences, aversions, and goals. The technique was used with 88 Caucasian and Negro Job Corps enrollees and 91 Caucasian and Negro ninth grade pupils.

Results are interpreted in terms of ways occupational goals appear to be influenced by socio-economic and psychological security.

Toshio Akamine and Harold G. Heiner, "Development of an Experimental Forced-choice Occupational Preference Inventory," FINAL REPORT NO. 23. Transmitted to USOE September 30, 1968.

The purpose was to further develop a forced-choice occupational preference inventory described in REPORT

NO. 3. The objective is to help pupils analyze their occupational interests and to provide information about pupils' attitudes toward relatively specific elements of work involved in some occupations likely to provide opportunity for youth who do not complete college.

The inventory is designed to evoke responses indicating preferences for acts, tools, materials, environments, and human relationships generally associated with work in building trades, office, automobile service, health aids, and retail occupations.

The prototype inventory was revised on the basis of initial testing. A Response Record Sheet and an Occupational Preference Profile chart that can be prepared from data provided by the Response Record Sheet have been designed. The revised instrument was used experimentally with 92 Caucasian and 81 Negro ninth grade pupils.

Results indicate that the instrument in its present form does help set the stage for guidance and more realistic exploration of acts-tools-materials-environment-human relationship dimensions of occupations.

Clusters Studies

Ten studies of clusters of capabilities useful in fields of allied health, office, distributive, electronics and construction occupations were made by both interview and questionnaire. Subjects included employees and supervisors. Two others, (Child Care and Food Service) were designed but not completed due to reductions in projected Project funding.

Titles of clusters studies reports and the dates on which they were filed with USOE follow.

Boyd C. Mills and Harold F. Rahmlow, "Major Tasks and Knowledge Clusters Involved in Performance of Electronic Technicians' Work," FINAL REPORT NO. 4. Transmitted to USOE February 3, 1967.

The purpose was to identify clusters of knowledges most widely useful in major types of work commonly done by electronic technicians.

Principal tasks of technicians were classified as diagnosing trouble in systems; adjusting and/or operating; servicing; assembling; installing; designing and computing; application, distribution, and sales in electronics; and quality control and testing. A questionnaire listing 643 knowledges extracted from textbooks, curriculum guides, and courses of study was administered to a sample of workers in 64 establishments broadly representative of the national pattern of electronic technicians' work.

Technicians deemed 84 of the 643 knowledges essential for performance of six of the eight principal tasks and 154 essential for performance of three to five principal tasks.

Edward A. Perkins, Jr., and F. Ross Byrd, "A Research Model for Identification of Task and Knowledge Clusters Associated with Performance of Major Types of Office Employees' Work," FINAL REPORT NO. 5. Transmitted to USOE February 3, 1967.

The purpose was to develop a research model designed to identify (a) the major tasks performed by a representative sample of office workers within any geographical area; (b) the major knowledges required to perform those tasks; and (c) the essential combinations of "tasks and knowledge clusters," which will help educational curriculum planners develop instructional programs and materials that will maximize career-long occupational opportunity, competence, and choice.

An office workers' population was identified by using Federal Census data and data from state governmental agencies. With the assistance of university statisticians and electronic computers, a sample was selected in proportion to the number of office workers in five office-size categories within each major Standard Industrial Classification grouping. A questionnaire composed of 600 office tasks was validated by 286 office

workers and supervisors and by a jury of experts. A structured procedure was developed for the distribution of the data-gathering instrument, analysis of data, and identification of knowledges associated with the performance of tasks.

The paradigmatic construction for a task-knowledge investigation is presented in the form of five flow charts. For report on further development, see Edward A. Perkins, Jr., F. Ross Byrd, and Dennis E. Roley, "Clusters of Tasks Associated with Performance of Major Types of Office Work," Project No. OE7-0031, Contract No. OEG-4-7-070031-1626, FINAL REPORT NO. 14.

Kenneth A. Ertel, "Identification of Major Tasks Performed by Merchandising Employees Working in Three Standard Industrial Classifications of Retail Establishments," FINAL REPORT NO. 6. Transmitted to USOE February 3, 1967.

The purpose was to identify major tasks performed by merchandising employees working in three Standard Industrial Classifications of retail establishments. Those classifications are department stores, variety stores, and general merchandise stores.

A questionnaire was used to obtain facts regarding twelve categories of work performed by supervisory and non-supervisory personnel. Those categories are selling, stockkeeping, checkstand operation, receiving and marking merchandise, delivery, keeping records, computing, display, advertising, buying, pricing, and merchandise control. Percentages of employees performing each category of work were determined.

This information will be utilized as bases for identification of clusters of knowledges associated with performance of work done by substantial percentages of employees. For report on further development, see Kenneth A. Ertel, "Clusters of Tasks Performed by Merchandising Employees Working in Three Standard Industrial Classifications of Retail Establishments," Project No. OE7-0031, Contract No. OEG-4-7-070031-1626, FINAL REPORT NO. 20.

William A. Bakamis and Robert E. Kuhl, "Identification of Task and Knowledge Clusters Associated with Performance of Major Types of Building Trades Work," FINAL REPORT NO. 7. Transmitted to USOE February 3, 1967.

The objective was to identify clusters of knowledges widely used by building trades workers. It was assumed that up-to-date facts defining the nature of work in the selected building trades and clusters of knowledges and competencies associated with performance of such work would provide schools and community colleges with partial bases for realistic curricula planning.

By questionnaires and interviews, facts were obtained regarding major types of tasks performed by a representative sample of brick layers, carpenters, cement finishers, electricians, iron workers, plasterers, plumbers, painters. sheet metal workers, and heating workers. On the bases of that information, a jury comprised of vocational teacners, a scientist, a mathematician, language arts specialist, employees, and supervisors identified knowledges associated with performance of major tasks.

Clusters of widely useful mathematics, science, and communication knowledges were defined. It is assumed that, along with requisite skills, acquisition of such knowledges will help pupils succeed in entry jobs and serve as bases for retraining, occupational mobility, and career-long advancement.

Harold F. Rahmlow and Leonard T. Winchell, "Mathematics Clusters in Selected Areas of Vocational Education," FINAL REPORT NO. 8. Transmitted to USOE February 3, 1967.

The objective was to conceptualize and identify mathematical knowledges commonly useful for work in occupations most likely to provide employment for substantial numbers of non-college bound youth.

Task items from questionnaires used in office, general merchandise retailing, building trades, electronics, food service, child care and agriculture studies were examined by a mathematician and practitioners for mathematical knowledge content.

Five clusters of mathematics knowledges were found to be useful in all the areas studied. These clusters were: operations with fractions, operations with decimals, conversion of fractions to decimals, concept of percentage, ratio and proportion.

For report on further development, see Harold F. Rahmlow, "A Series of Programmed Instruction Books for Learning Occupationally Oriented Basic Mathematics," Project No. OE7-0031, Contract No. OEG-4-7-070031-1626, FINAL REPORT NO. 16.

Harold F. Rahmlow, LeRoy Johnson, and Catherine Cavanagh, "A Survey Instrument for Identifying Clusters of Knowledge and Competencies Associated with Performance of Food Service Work," FINAL REPORT NO. 9. Transmitted to USOE February 3, 1967.

The purpose was to develop a survey instrument for identification of major tasks performed by workers employed in establishments and institutions providing food service.

A team of home economists, managers of commercial and institutional food service establishments, and food service employees conceptualized and field tested a survey instrument to obtain up-to-date facts about major types and combinations of tasks performed by food service workers.

A representative sample of food service workers is being identified. The instrument will be utilized to obtain data that will (1) provide up-to-date facts about combinations of work done by various categories of food service workers, (2) provide a base for identification of clusters of knowledges and competencies essential for effective performance of tasks constituting work patterns, and (3) ascertain the degrees to which such knowledges and competencies are congruent with those essential for work in other non-professional occupations.

Due to reductions in budget projections this instrument has not been used to collect data.

Harold F. Rahmlow and Catherine Cavanagh, "A Survey Instrument for Identifying Clusters of Knowledge and Competencies Associated with Performance of Child Care Work," FINAL REPORT NO. 10. Transmitted to USOE February 3, 1967.

The objective was to develop a survey instrument for identification of major tasks performed by non-professional workers employed by organizations, institutions, and agencies providing child care service.

A team of home economists and day care center employees and supervisors conceptualized and field tested a survey instrument to obtain up-to-date facts about major types and combinations of tasks performed by child care workers.

A representative sample of child care workers is being identified. The instrument will be utilized to obtain data that will (1) provide up-to-date facts about combinations of work done by various categories of child care workers, (2) provide a base for identification of clusters of knowledges and competencies essential for effective performance of tasks constituting work patterns, and (3) ascertain the degrees to which such knowledges and competencies are congruent with those essential for work in other non-professional occupations.

For report on further development, see Harold F. Rahmlow and Shirley O. Klehn, "A Survey and Analysis of Major Tasks, Knowledges Associated with Work in Child Care Occupations," Project No. OE7-0031, Contract No. OEG-4-7-070031-1626, FINAL REPORT NO. 15.

Edward A. Perkins, Jr., F. Ross Byrd, and Dennis E. Raley, "Clusters of Tasks Associated with Performance of Major Types of Office Work," FINAL REPORT NO. 14. Transmitted to USOE March 8, 1968.

This study identified clusters of tasks performed by office employees working in twelve Standard Industrial Classifications. A questionnaire composed of 599 office tasks was validated.

A proportional, stratified random sample of 295 firms in the private enterprise sector and 28 government agencies was selected. The sample was structured to include five office-size categories within each of the following SIC's: Agriculture; Mining; Construction; Manufacturing; Transportation; Communication and Utilities; Wholesale Trade; Retail Trade; Finance, Insurance, and Real Estate; Services; Government; and Education.

A total of 663 office employees responded. They were classified in six broad occupational categories: supervision, secretarial-stenographic, clerical, bookkeeping-accounting, business machine operators, and data processing. The 599 office tasks were clustered within 13 major categories of tasks--typewriting, office machines and equipment, dictation and transcribing, mailing, filing, telephoning and communicating, clerical, securing data, mathematics, financial and recordkeeping, editorial, meeting and working with people, and miscellaneous.

Percentages of employees in five sizes of offices in each SIC who perform each task were computed. Analysis of data supported two hypotheses: (1) There are significant differences in tasks performed by office employees in the various industrial classifications, and (2) there are significant differences in tasks performed by office employees in small and large offices.

Percentages of employees performing each task were ranked in descending order for each of the six broad job classifications and for a "composite" of all six classifications.

Harold F. Rahmlow and Shirley O. Kiehn, "A Survey and Analysis of Major Tasks, Knowledges Associated with Work in Child Care Occupations," FINAL REPORT NO. 15. Transmitted to USOE December 11, 1967.

The purpose was to identify knowledge and competency clusters associated with effective work in non-professional child care occupations. A survey instrument was field tested and validated.

A sample of 96 leading-edge child care centers in four types of child care agencies was selected, and 259 completed questionnaires were received from a representative portion of the sample. Responses were categorized and data were tabulated by computer.

A jury of supervisors and educators identified essential knowledges and classified them in four clusters: (1) child development, (2) materials, (3) physical arrangements, and (4) general. Major tasks were ranked in descending order, and personal characteristics of child care workers ascertained.

Kenneth A. Ertel, "Clusters of Tasks Performed by Merchandising Employees Working in Three Standard Industrial Classifications of Retail Establishments," FINAL REPORT NO. 20. Transmitted to USOE September 30, 1968.

The objective was to identify major clusters of tasks performed by merchandising employees working in three Standard Industrial Classifications. Those classifications are department stores, variety stores, and general merchandise stores.

A stratified random sample was drawn, and usable questionnaires were received from 609 supervisory and non-supervisory personnel regarding tasks performed in twelve categories of work.

Data indicate that substantial percentages of non-supervisory personnel perform the tasks of selling, keeping and counting stock, operating the check-stand and sales register, and receiving and checking merchandise. Substantial percentages of supervisors regularly perform all the activities of non-supervisors. Supervisors also keep accounts and records, plan and arrange interior displays, buy merchandise for resale, and price and control merchandise.

Data indicate only limited opportunity for non-college-bound youth to move from non-supervisory to supervisory positions. There was no evidence that participation in distributive education without post-high school education enhanced opportunity for employment as a supervisor.

Robert J. Wallenstien, "Knowledges Commonly Useful in Twelve Allied Health Occupations," FINAL REPORT NO. 25. Transmitted to USOE September 30, 1968.

The purpose was to ascertain the extent to which there exist commonalities of knowledge essential for effective work in twelve allied health occupations. Identification of such commonalities may provide a partial base for curriculum planning and for evaluating technician training programs.

This study identified clusters of 279 items of knowledge about anatomy, physiology, microbiology, chemistry, physics, psychology, and sociology which 89 supervisors and practitioners judged to be commonly useful in the following 12 allied health occupations: dental assistant, dental technician, occupational therapy assistant, physical therapy assistant, medical assistant, medical records technician, cardio-pulmonary technologist, registered nurse, practical nurse, x-ray technician, medical secretary and medical laboratory technician.

Gilbert A. Long, "Clusters of Tasks Performed by Washington State Farm Operators Engaged in Seven Types of Agricultural Production: Grain, Dairy, Forestry, Livestock, Poultry, Horticulture, General Farming," FINAL REPORT NO. 27. Transmitted to USOE April 22, 1968.

The objective was to obtain up-to-date facts about clusters of tasks performed by farm operators engaged primarily in production of grain, livestock, dairy commodities, poultry, forest products, horticultural commodities, and general farming.

A proportional sample of 267 farmers was identified. A questionnaire was designed to ascertain farmers' performance of tasks classified as animal care, plant production, land management, harvesting and processing, general management, marketing, equipment use and care, and building maintenance and construction. Usable responses were received foom 178 farmers.

Results indicate that tasks classified as management, marketing, animal care, and plant production are performed by large percentages of all categories of farm operators.

Experimental Prototype Instructional Materials and Systems

On the basis of our clusters studies and other related research we formulated behavioral objectives and developed and pilot tested 8 sets of experimental instructional materials and/or prototype instructional systems, designed to provide individually paced self instruction. These prototypes are comprised of varying combinations of teachers guides, programmed books including self-testing devices and sound films or slide-tape sequences. Pilot tests were designed to ascertain amounts of time pupils require to acquire predefined levels of cognitive and motor capability, and to identify ways the prototypes can be improved.

The following reports were filed on February 3, 1967.

Gilbert A. Long, Joel H. Magisos, and Stanford Sleeth, "Transparency Masters for Agricultural Education," FINAL REPORT NO. 11. Transmitted to USOE February 3, 1967.

> The purpose was to ascertain the effects of involving vocational agriculture teachers in the development and experimental use of visual instructional materials (overhead projection masters).
>
> In workshops, thirty-five teachers planned, used, and recommended revisions of masters.
>
> Follow-up revealed that 83 per cent of the vocational agriculture teachers in Washington used the materials during the 1966-67 school year. Eighty-nine per cent expressed desire for additional materials of this type.

Gilbert A. Long, "Animal Nutrition. Programmed Instruction Units: Animal Nutrition, Feed Characteristics, Vitamins, Minerals," FINAL REPORT NO. 12. Transmitted to USOE February 3, 1967.

> The purpose was to develop four experimental units of programmed materials that will help youth and adults acquire and use knowledge about elements of animal nutrition, feed characteristics, the functions of minerals, and the functions of vitamins. A second objective was to stimulate experimental use of the materials by involving teachers in their development.

Principles and facts requisite for effective animal nutrition practices were identified by examination of recent scientific reports. Sixteen vocational agriculture teachers were involved in development and experimental use of the programmed learning materials.

Evidence of instructional results is not yet available. A tentative conclusion may be made that teacher involvement has activated analytical assessment of objectives and interest in innovative instruction.

Gilbert A. Long, "Land Judging and Plant Nutrition: A Programmed Instruction Unit," FINAL REPORT NO. 13. Transmitted to USOE February 3, 1967.

The objective was to develop an experimental unit of programmed instruction materials designed to help students acquire and use knowledge of land-judging principles and procedures. A second objective was to stimulate experimental use of the materials by involving teachers in their development and use.

Principles and facts requisite for effective land classification and plant nutrition practices were identified by examination of recent scientific reports. Sixteen vocational agriculture teachers were involved in development and experimental use of this unit of programmed learning materials.

Evidence of instructional results is not yet available. The tentative conclusion may be made that teacher involvement has activated analytical assessment of objectives and interest in innovative instruction.

Harold F. Rahmlow, "A Series of Programmed Instruction Books for Learning Occupationally Oriented Basic Mathematics," FINAL REPORT NO. 16. Transmitted to USOE September 30, 1968.

The objective was to develop and test self-pacing programmed instruction books designed to help pupils independently acquire mathematics

capabilities associated with work in building trades, office, retailing, electronics, food service, child care, and agricultural occupations.

Behavioral objectives were derived from facts obtained by clusters studies reported above. Mathematicians, workers, and supervisors verified 21 specific mathematic competencies. The programmed books cover:

Symbols
Representing Numbers by Letters
Equivalent Forms
Ratios and Fractions
Addition of Fractions
Subtraction of Fractions
Multiplication of Fractions
Division of Fractions
Concepts of Decimals & Fractions
Addition & Subtraction of Decimals
Multiplication of Decimals
Division of Decimals
Conversion of Fractions into Decimals
Equivalent Forms of A = BC
Solutions of A = BC
Percentage
Commutative Law
Reciprocals
Scientific Notation
Proportions
Concepts of Number Bases

Books are presently being field tested. Content is also being computerized for experiments with computer aided instruction.

Dale L. Nish, "The Development and Testing of a Polysensory Instructional System for Teaching Knowledges and Skills Associated with the Use of Expandable Polystyrene Plastics," FINAL REPORT NO. 18. Transmitted to USOE April 9, 1968.

The purpose was to develop an experimental self-instructional system to provide evidence about the degrees to which, and the amounts of time in which, such a system enables students with varying abilities to acquire certain types of knowledges and skills.

A self-instructional polysensory system comprised of four single-concept films, programmed books and laboratory work experiences was developed and tested. The system was designed to enable students to reach predefined levels of knowledge and capability needed to use materials and equipment for production of a plastic object. Thirty junior

and senior high school students in three mental ability categories served as subjects. All subjects independently acquired predefined levels of knowledge and capability. Time used to reach those levels varied.

Results indicated that such a system is an effective means of enabling pupils to acquire knowledge, manipulative skills and judgments of the types taught by the system.

Edwin K. Hill, "The Development and Testing of an Experimental Polysensory Self-instructional System Designed to Help Students Acquire Basic Electrical Occupational Competencies," FINAL REPORT NO. 19. Transmitted to USOE April 30, 1968.

The objective was to develop an experimental self-instructional system enabling learners to acquire occupationally useful electrical knowledges and capabilites.

A polysensory self-instructional system, comprised of a teacher's guide, programmed instruction book, series of slide-tape sequences, and a circuit board, was developed and tested. Content includes forms of electrical energy, energy transmission, and the nature of simple circuits.

Preliminary tests with 30 male and female pupils ranging from third to twelfth grade demonstrated that by use of the system for independent study, pupils do generally acquire predefined levels of capability. Amounts of time pupils use to achieve defined levels of capability vary. Variations are associated with differences in age and mental ability.

Harold A. Sergeant, "Development and Testing of an Experimental Polysensory Instructional System for Teaching Electric Arc Welding Processes," FINAL REPORT NO. 24. Transmitted to USOE September 30, 1968.

The purpose was to ascertain the extent to which a self-instructional system is effective in helping students achieve concepts and high level perceptual-motor skills involved in electric arc welding.

A self-pacing multimedia, self-instructional system was developed. Components of the system are: pretest and

posttest, general instructions book, arc welding equipment, programmed instruction books, and loop films. The system was experimentally tested with 35 high school, college, and adult subjects.

All subjects acquired defined levels of capabilities, but amounts of time individuals used for such achievement varied from 3 hours, 30 minutes to 13 hours. The average was 5 hours.

Kenneth A. Ertel, "Development of a Retailing Instructional System for Distributive Education," FINAL REPORT NO. 26. Transmitted to USOE September 30, 1968.

The purpose was to create materials which would enable non-college-bound youth to acquire competencies necessary for entry level employment in the general merchandise retail field.

Instructional systems concepts were utilized in preparing for field testing nine sub-systems of instruction in retailing. The sub-systems are: (1) Salesperson's Job, (2) Qualities of Salesperson, (3) Customers' Buying Motives, (4) Selling Process, (5) Merchandise Information, (6) Cash Register Operation, (7) Stockkeeping Task, (8) Retail Recordkeeping, (9) Working With People.

Linear style programmed instruction in written form is used as the primary instructional vehicle. A polysensory multi-media programmed instruction presentation was achieved by integrating concepts in written, audio, and visual styles.

Prototype components of an instructional system have been developed and are ready for field testing. Components include 23 programmed instruction booklets and eight Audiscan sound slide films.

F. Ross Byrd and Barbara A. Christensen, "An Experimental Self-instructional System for Introducing Gregg Shorthand," FINAL REPORT NO. 28. Transmitted to USOE September 30, 1968.

The purpose was to explore the extent to which a prototype multi-media self-instructional system comprised of 48 lessons can be used to help eleventh and twelfth

grade students acquire defined levels of Gregg shorthand capabilities.

Criteria for measuring student competencies at interim points and at the completion of the system and interim and terminal performance objectives were defined. Prerequisite entry abilities were also defined to provide a basis for later selection of a population suitable for realistically testing the system.

Learning tasks necessary to achieve minimum competencies in the first six lessons of the system have been identified and sequenced. An evaluation matrix to measure student achievement has been developed. A proposed strategy for enabling learners to perform the Lesson 6 criterion tasks has been identified and appropriate content materials have been developed.

A prototype of lessons 1-6 is completed and ready for pilot testing.

Much of our instructional systems work, especially pilot testing, was pursued in cooperation with the Northwest Regional Educational Laboratory and a Title III project designed to modernize and enrich instruction in small schools.

Prototype Model for Adapting Defense Department Instructional Materials for Civilian Use

The U.S. Naval Training Aids Center at Treasure Island, California has on file approximately 42,000 transparencies and 500 instructional films. On the basis of our September 25, 1967 memorandum confirming a modification of work plans, the Project staff arranged for access to these items and employed vocational educators as consultants to evaluate their usefulness. The consultants selected 2800 transparencies deemed useful for civilian instruction in electronics, electricity, engine maintenance, communication and construction. Those items were purchased jointly by the Project, the Washington State Department of Vocational Education and the Northwest Regional Educational Laboratory.

To test the feasibility of *indexing and packaging* such items in form suitable for civilian instruction Alan Stoller prepared component REPORT 29, INSTRUCTOR'S INDEX OF U.S. NAVY AND AIR FORCE MATERIALS FOR TEACHING BASIC ELECTRICITY. Transmitted to USOE September 39, 1968.

The purpose was to index U.S. Navy and U.S. Air Force transparencies, films, and manuals in units designed for teaching basic electricity in community colleges, schools and adult classes.

The index classified items into 42 instructional units. Selected films produced by other educational agencies and private firms are also listed. Items were selected by representatives of State Departments of Education from Washington, Idaho, Oregon, Colorado, and Utah. The Index was reviewed by Vocational Education Directors of Washington, Idaho, Alaska, Oregon, and Montana.

Consultants estimate that approximately 13,000 of the Navy items will be useful for instruction in para-medics, communication, oceanographic technology, aircraft service, marine equipment service, and construction.

The Northwest Regional Educational Laboratory is sponsoring a proposal to utilize the Stoller model as a basis for classification and indexing of other materials available at the Naval Training Aids Center.

Distributive Education Audio-Visual Aids Listing

As component REPORT NO. 22, Jerry C. Levendowski prepared a classified listing of "Audio Visual Instructional Materials for Distributive Education". Transmitted to USOE April 30, 1968.

Materials of various types are categorized in 14 instructional areas: advertising and display, business and consumer credit, commodity and stock markets, consumer information, economics, labor-management relations, marketing and merchandising, money and banking, occupational guidance, oral and written communications, personality and attitude development, salesmanship, supervision and human relations, and supporting distributive occupation skills. The distributor, cost, and suitable student population are identified for each item. Most item descriptions were derived from distributor catalogs.

We did not contract for this service, but items were located while searching for components that might be useful for development of a prototype retailing education systems. Northwest State Departments requested and financed preparation of the list. We filed the REPORT as an unofficial adjunct to our contract.

EVALUATION AND PLANS FOR RELATED WORK

Errors and Delays

We made our share of errors.

Work on our clusters studies was delayed by discussions clarifying concepts of clusters and by honest differences of view regarding ways data could best be procured and processed. Discussion about the nature and scope of adequate data continues. We deem much of this to be inevitable and desirable.

Among staff members and associates discussion continues regarding the adequacy of our procedures for formulation of behavioral objectives for instructional system development. This has slowed some work but it also reflects critical analysis.

The Project was funded effective July 1, 1965. By July of any year the time of most competent university personnel and graduate assistants is committed for the coming year. Consequently for a semester the time staff could allocate to Project work was limited.

Delays in Second Stage (December 1966) funding adversely affected employment of staff and morale.

Motivational Studies

We believe that our motivational studies, along with related research enrich concepts of occupational guidance and counseling and provide data for improving guidance and counseling programs. Slocum and

Bowles' studies of socio-economic factors affecting pupils' occupational and educational aspirations and expectations throw light on matters to be considered by school systems and community colleges when planning vocational programs adequate for pupils with varying backgrounds. Such facts are of particular importance to development of curricula and guidance services for socio-economically disadvantaged pupils.

Slocum is participating in preparation of an interdisciplinary Washington State University proposal to use results of these studies and related research as a partial basis for development of occupational monographs that can be used by social studies, language arts, science and mathematics teachers to help give elementary and junior high school pupils access to facts about modern occupations and their relationships to them.

Occupational Attitude Measurement

The forced-choice and projective devices developed by Heiner, Olsen, Akamine, Garlington and Whipple provide potential means of providing teachers and counselors with better information about pupils' existing occupational perceptions. They also can help pupils clarify their perceptions and goals. Pupils respond very favorably to use of our forced-choice device. Akamine plans to utilize all available resources for its further validation and for development of alternate forms suitable for use by elementary and community college students with varying types of backgrounds.

Instructional Systems Development

Our experiments with semi-self-instructional systems conducted by Sakamis, Gallegos, Ertel, Eyrd, Nish, Sergeant, and Hill indicate that by use of such procedures pupils can acquire levels of cognitive and motor capabilities defined as adequate for effective work.

We believe that further experiment will be productive. There is need for more facts about ways various combinations of components affect the achievements and attitudes of pupils possessing various types of backgrounds and motivations.

We hypothesize that a next major advance in systems development will come from utilization of the immense reinforcement power research indicates to be inherent in peer group association. At Washington State University Title III Directors, Dr. Arnold Gallegos and Dr. William Bakamis plan to pursue such work in cooperation with Dr. Chester Hawkins of the Northwest Regional Educational Laboratory.

By developing additional indexes such as the one described in REPORT NO. 29, the Northwest Regional Educational Laboratory hopes to lay a foundation for utilization of Navy and other Department of Defense teaching aids as components of semi-self-instructional systems.

Synergy of Cooperative Effort

The Project has functioned as a catalyst stimulating the compounded results of cooperative endeavor. State Directors of Vocational Education and their associates have participated in Project work and are beginning to utilize instructional materials. The Washington State Department of Vocational Education contributed $10,000 to Project work. All five Northwest State Directors have participated in plans to obtain and utilize Navy training aids. Spokane Community College contributed the time of Dr. Robert Wallenstein who prepared REPORT NO. 25. Working relationships and joint efforts with Title III and the Northwest Regional Laboratory personnel provide a foundation for continuation of cooperative work.

Response of Washington State University

The President has approved employment of a competent person to coordinate a modernized interdepartmental program for preparation of vocational teachers, counselors and administrators to meet the growing needs of community colleges, high schools and adult programs.

Along with WSU's College of Education Dean and Education Department Chairman, the Vice President is considering ways to allocate additional university resources to a long-range vocational education research and development effort.

Nine faculty members, not paid by Project funds, have contributed advice and service. These include psychologists, economists and sociologists.

Graduate seminars in economics, psychology, sociology and education have participated in planning Project work and discussion of results.

Five education and sociology staff members are presently evaluating Project work and planning proposals for long-range continuation of next steps deemed desirable and feasible.

Eight young staff members, trained on the Project and our Guidance and Counseling Institute, are now employed in occupational education work at the American Institutes for Research, International Business Machines, Washington State Department of Vocational Education and in local school systems.

WSU College of Education Intentions and Plans

Looking to the immediate future, Washington State University College of Education Dean, George B. Brain affirms that "Both research and observation demonstrate the growing need for modernizing occupational education to better prepare more young citizens to produce and to earn incomes in a technological age. The scope and urgency of this need is documented by massive bodies of facts reported by the President's Manpower Commission, the American Association for Advancement of Science, the American Council for Education and numerous other competent observers.

As a Land-Grant institution, Washington State University recognizes its particular social and moral obligation to pursue research and to prepare the instructors, counselors and administrators that will enable teacher education institutions, community colleges, high schools and adult programs to meet this need. The College of Education intends to fulfill its share of that responsibility.

We have welcomed the financial assistance provided by federal funding of Project OE7-0031. We intent to continue related work to the limit of our own resources. But need exceeds our resources. When additional federal funds are available we will again request assistance necessary for fully adequate effort."

OE 6000 (REV. 9-66)

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF EDUCATION

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602 Vocational Education
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ABSTRACT

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801 This document is a summary and evaluation of a 3-year interdisciplinary effort
802 to improve vocational education. It presents resumes of four inter-related
803 efforts. (1) Identification of socio-economic factors that affect pupils'
804 occupational and educational aspirations, expectations and plans.
805 (2) Identification of clusters of capabilities (concepts, knowledge, skills
806 and attitudes) that are widely useful in occupations providing opportunities
807 for youth who do not complete college. (3) Development and pilot testing of
808 semi-self-instructional systems designed to help pupils acquire levels of
809 cognitive and motor capabilities defined as adequate for effective work.
810 (4) Experimental organization of U.S. Navy training aids for use in
811 civilian vocational education programs. Plans for continuation of related
812 work are summarized.
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